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AEDES (HOWARDINA) ALLOTECNON, A NEW SPECIES OF AEDES FROM COSTA RICA, AND A DESCRIPTION OF THE LARVA, ADULT, AND MALE TERMINALIA OF AEDES QUADRIVITTATUS COQ.[1]

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During the course of a mosquito survey of Costa Rica, the senior author collected *Aedes* larvae from bromeliads in several localities at high altitudes. Adults were obtained from these larvae, and it was noted that although the imagos were nearly identical, the larvae from which they were reared were of two quite different kinds. Further search in similar locations resulted in obtaining a good series of both kinds of larvae, and of adults reared from them. Because of the very distinct larval differences, undoubtedly two species are present, the larvae of which may occur in the same bromeliad. The adults resemble each other closely, conforming to the description by Coquillett (1) and that given by Howard, Dyar, and Knab (2) for *Aedes* (*Howardina*) *quadrivittatus*. Slight differences in the mesonotal pattern of golden-scaled lines are present in the adults of the two species, but insufficient material is in hand to permit a statement as to the range of variation in this pattern.

The junior author examined the material in his collection from Panama, and found that he had collected from a bromeliad on the slopes of Chiriqui volcano in northern Panama a perfect larva of the type also obtained from bromeliads in Costa Rica, which has all the head-hairs in multiple tufts. He also had two males, and a number of females, all in poor condition and with the mesonotum badly rubbed. In addition he had one male and six females taken by Mr. Graham Fairchild at Finca Lerida, near Boquete, Panama, on the other side of the Chiriqui volcano from the locality in which he took his material. Unfortunately, the mesonotum is denuded in every specimen taken by Mr. Fairchild, so it is impossible to make out the markings.

[1] The studies and observations on which this paper is based were conducted with the support and under the auspices of the International Health Division of The Rockefeller Foundation, the United States Public Health Service, and the Gorgas Memorial Laboratory.

The male terminalia of all the male specimens of the two species were dissected and mounted, and very few differences were noted in them. One of the males from Chiriqui Volcano had two long setae from the claspette, while all the other specimens, whether from Panama or Costa Rica, had but one seta in this position.

Slight but apparently inconstant differences in the mesosome of the male terminalia of the two species were noted. In males obtained from the larvae from Costa Rica, with single posterior head-hairs, the apex of the mesosome curved forward in the form of two slightly projecting horns. In one of the males of the other species with all the head-hairs multiple, the apex of the mesosome did not have these forward-projecting horns. There were no constant differences in the length of the terminal spine of the clasper, or in the arrangement of the setae on the lobes of the ninth tergites, in either species.

Coquillett described *Aedes quadrivittatus* from females taken at Chaculá, Guatemala. Neither males nor associated larvae were obtained. As it is apparently impossible to distinguish with absolute certainty the two sorts of female adults obtained from very different kinds of larvae by the senior author, the question arises as to which species is the true *quadrivittatus* of Coquillett. It is doubted whether collecting in the type locality would settle the problem, as both species have been found as larvae in the same bromeliad in Costa Rica. By the principle of the first reviser, we propose to restrict the name *quadrivittatus* Coquillett to the species in which the larva has multiple head-hairs, and other larval characters as described under that name in the present paper. The other species will be described as new, under the name *Aedes* (*Howardina*) *allotecnon*, new species. In this the larval head-hairs are not in multiple tufts.

Aedes (Howardina) allotecnon, new species.

Adult Female.

Proboscis moderate, uniform, black. Palpi about one-sixth the length of the proboscis, black, with white tips. Clypeus brown, nude. Occiput with narrow median pale-golden line; on each side a narrow black line, a wider white line, and a black line; cheeks whitish.

Mesonotum with integument dark, clothed with narrow curved brown scales; four narrow, uniform, golden lines on dorsum, extending from anterior margin to scutellum; a small golden spot beneath anterior promontory. Lateral margins of mesonotum golden-scaled, giving appearance of six golden lines on mesonotum. Scutellum with golden scales on middle lobe, long brown setae on outer lobes. Pleura brownish, with patches of white scales on prothoracic lobes; paratergites (just posterior to spiracle); proepisternum; lower margin on anterior pronotum; lower and upper margins of sternopleuron; just anterior to prealar

setae; diagonally across middle of mesepimeron; and before upper mesepimeral setae.

Abdomen: Clothed with flat black scales; lateral basal segmental silvery-white spots on segments, apices with long brown setae.

Legs: Fore-legs dark brown, a very small basal white spot on 1st tarsal segment. Mid-legs dark brown; mid-femur with a white spot on outer two-thirds; extreme apex white. Mid-tibia dark brown.

Mid-tarsi black, with narrow white rings on bases of 1st and 2d segments; 3d and 4th segments black. Sometimes the ring on 2d segment is obsolete.

Hind-femur basally half white, remainder dark brown; a small white spot on outer three-fourths; apex narrowly white. Hind tibia dark brown.

Hind tarsi black, with narrow white rings at bases of 1st, 2d and 3d segments, widest on third; 4th and 5th segments black. Claws on all feet simple.

Wings narrow, hyaline, with narrow brown scales.

Male palpi: About as long as proboscis, slender, nearly uniform, pointed; dark brown, with white rings on under side of base of terminal segment, on under side of base of penultimate segment, and a few white scales at junction of 2d and 3d segments.

Description of Male Terminalia of *Aedes allotecnon*, n. sp.

Side-pieces (coxite) long, tapering, conical, without apical or basal lobe. Claspette a triangular area clothed with a few fine hairs and some larger setae, and having a single (sometimes two) long, slender, tapering spine arising from the apex, and extending to the apical third of the side-piece. Outer aspect of side-piece clothed with dense truncate scales and long, projecting setae.

Clasper long, tapering, abruptly curved inward just before tip; one long seta inserted on outer aspect of clasper just before curve; terminal spine long, slender, curved, slightly tapering.

Mesosome short, somewhat cylindrical, the anterior face deeply excavate from apex and from base, forming a relatively narrow anterior bridge. Posterior face deeply excavate from apex almost to base, forming a very narrow lower bridge. Tips of mesosome produced anteriorly to form short forward-projecting horns.

Ninth tergites large, quadrate, somewhat rugose, the eminences from which the setae arise close together, chitinized; five or six long setae from apical margin, sometimes one or two lateral setae arising from membrane, which is covered with small microtrichia in irregular rows.

Tenth sternites moderate, with thickened apex forming a curved tooth.

Tenth tergites membranous, with three or four small setae from small tubercles below apex.

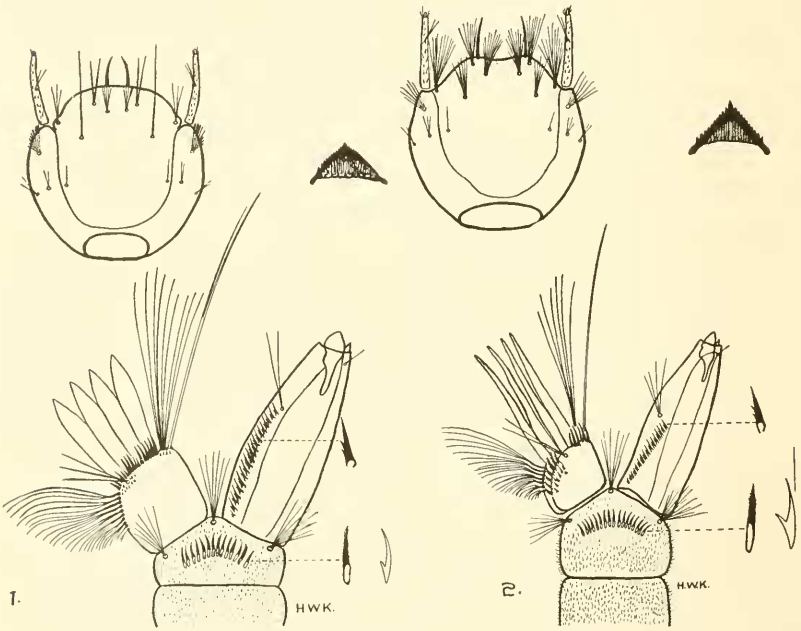
Description of Larva of **Aedes (Howardina) allotecnon**, n. sp.

Head: Subglobose, the dorsum highly arched, dome-shaped. Preclypeal spines very long, strong, heavily infuscated. Anterior head-hairs long, strong, double; middle head-hairs nearly as long as anterior hairs, fine, in tufts of 4 or 5. Posterior head-hairs single, finer than the anterior hairs, and nearly twice as long. Anteantennal hairs fine, double or triple, and longer than the antennae.

Inner occipital hairs long, fine, simple. Outer occipital hairs set somewhat posterior to inner hairs, long, fine, double or triple. Dorsal eye-hairs long, simple. Subantennal (or possibly the postmandibular) hairs multiple, consisting of a tuft of about 12 long, stiff, blunt-pointed hairs.

Antenna moderate, tapering, the shaft sparsely spined. Antennal tuft 2- or 3-haired, on dorso-internal aspect, inserted slightly beyond middle, the tips of the hairs scarcely exceeding apex of antenna.

Thorax: integument glabrous, clothed with numerous short, multiple, stellate hair-tufts.



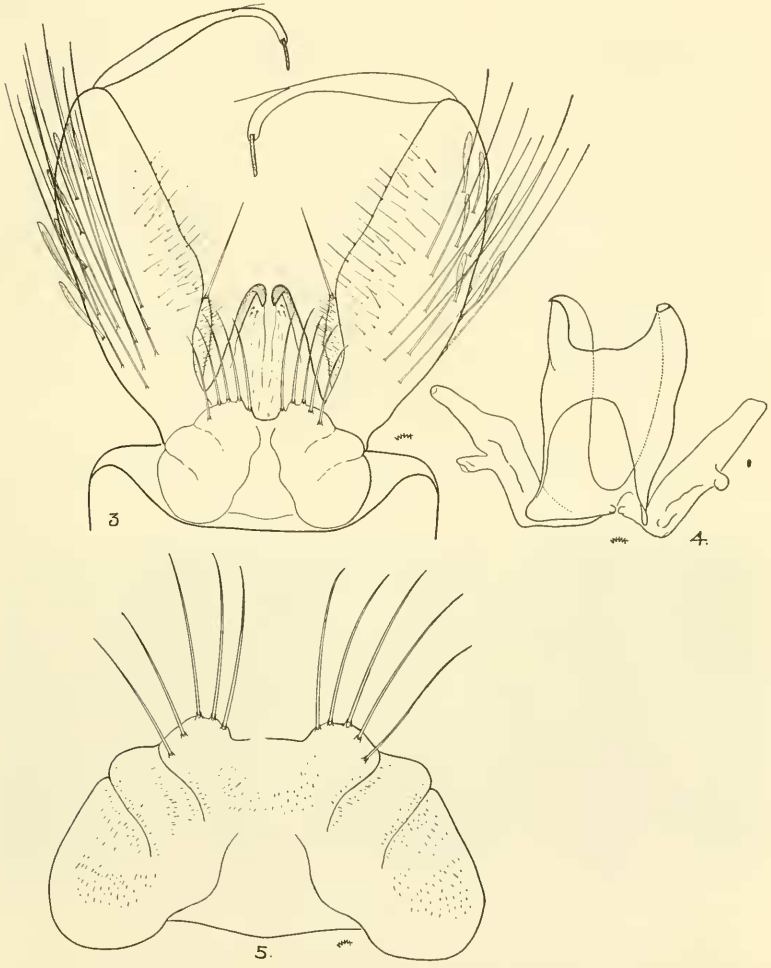
Abdomen: Integument glabrous, except for short, fine pilosity on seventh and eighth segments, sometimes present also on sixth segment. Lateral hairs on segment 2 triple, double on segments 3 to 6. Comb of eighth segment of about 15 long, slender scales, set close together in a slightly curved row. Each scale elongate, thorn-shaped, sharp-pointed, the sides very finely fringed almost to the tip.

Siphon moderate, tapering, slightly less than 4 times as long as width at base. Pecten a row of about 17 to 20 closely-spaced teeth, extending beyond middle of siphon. Each tooth long, usually with one or two short lateral barbs basally. Teeth progressively larger toward apex of siphon. Siphon-tuft beyond pecten, double or triple, long, the tips of the hairs extending to the apex of the siphon.

Anal segment not ringed by the plate. Posterior lateral and dorsal margins fringed with long, curved spines. Lateral hair of the plate long, double or triple,

sometimes quadruple. Inner caudal hair long, exceeding the length of the outer caudal hairs, usually double, sometimes split nearly from base, sometimes split beyond middle. Outer caudal hair a tuft of long hairs. Anal gills long, pointed.

Type locality.—Poas Volcano, Costa Rica. Altitude about 9,000 ft.



Type material.—3 males, bred from larvae found in epiphytic bromeliads. The male terminalia of each mounted in balsam on modified Cobb slide. Nos. 156, 156–A, 156–C.
H. W. Kumm, collector, April 14, 1938.

The skins of the larvae from which the types were reared are preserved with the type specimens.

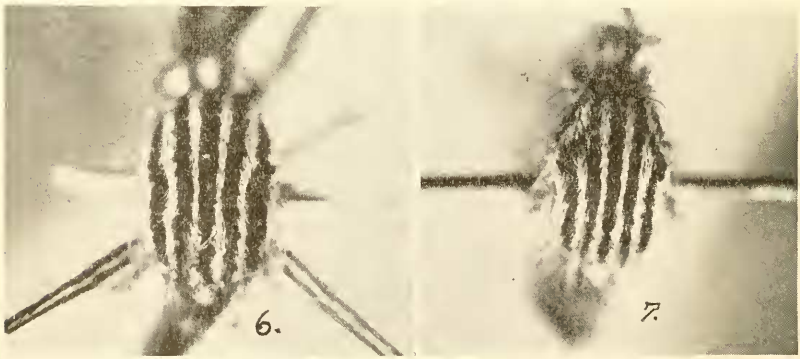
Types deposited in the collection of the U. S. National Museum, Washington, D. C.

Aedes (Howardina) quadrivittatus Coquillett. Adult Female.

Proboscis moderate, uniform, black. Palpi about one-sixth the length of the proboscis, black, with white tips. Clypeus brown, nude. Occiput with narrow median pale-golden line; on each side a narrow black line, a wider whitish-golden line, and a black line. Cheeks whitish.

Mesonotum with integument dark, clothed with narrow curved brown scales. A small golden spot below anterior promontory. Two narrow uniform median golden lines on dorsum, extending from anterior margin to scutellum; two narrow subdorsal golden lines extend from anterior margin to scutellum; lateral margins of mesonotum golden-scaled, forming a sinuous line which divides and incurves posterior to the lateral fossae, one branch joining the subdorsal golden lines, and the other extending forward over the anterior pronotum, enclosing a small S-shaped nude brown area. Sometimes the subdorsal golden lines are continuous, and sometimes they are broken posterior to their junction with the lateral margins of the mesonotum. Sometimes the lateral fossae may be shaded over with golden scales extending from the subdorsal lines.

Scutellum with middle lobe clothed centrally with flat golden scales, flat brown ones on each side; outer lobes with long brown setae and fine curved golden scales.



Abdomen black with large lateral basal segmental silvery-white spots on all segments, and long apical yellow-brown setae.

Legs: Fore-legs dark brown; a narrow basal white ring on 1st tarsal segment, and a small basal white spot on 2d tarsal segment; 3d, 4th and 5th segments dark brown.

Mid-legs with femur black on outer aspect, without white spot, but with apical white ring; basally half white, apically half black on inner aspect. Mid-

tibia black. Mid-tarsi black, with basal white rings on 1st and 2d segments; segments 3, 4 and 5 black. Hind-legs with femur basally half white, apically half black on both inner and outer aspects. No white spot on outer two-thirds, but a broad white apical ring. Hind tibia black. Hind tarsi black, with broad white basal rings on 1st, 2d and 3d segments, broadest on 3d, sometimes extending over basal three-fourths of segment; 4th and 5th segments all black. Claws on all feet simple.

Male palpi: About as long as proboscis, slender, nearly uniform, pointed; dark brown, with white rings on under side of base of terminal segment, on under side of base of penultimate segment, and a few white scales at junction of 2d and 3d segments; many long dark hairs on last two segments.

Male Terminalia.

Sidepiece moderate, slightly conical, rounded at apex, without basal or apical lobe, clothed outwardly with long slender setae and narrow striate round-tipped scales. Inner flap with sparse mesially-directed fine setae, outer flap with longer setae. Claspette a small triangular area at inner angle of sidepiece, bearing a single long slender seta (sometimes two) from a prominent tubercle at apex, extending well beyond middle of sidepiece; basally with a few weak setae from small tubercles. Clasper one-half as long as sidepiece, curved, tapering to tip, a seta on outer aspect slightly before tip; with a long, slender, curved, tapering terminal spine, about one-third length of clasper.

Mesosome: About 1 3/5 longer than wide, somewhat cylindrical, the anterior face shallowly, roundedly excavate from apex; a curved, hornlike forward projection from each side of apex; base somewhat flared, excavate about one-third from base anteriorly; posterior face deeply excavate nearly to base; lateral arms short, strong.

9th tergites broad, slightly rugose, quadrate; connected by a narrow apical bridge, covered with short microtrichia arranged in irregular rows; the apices sclerotized and rounded, bearing three or four long, strong, curved setae from large tubercles, and one or two smaller setae from tubercles below apex laterally.

10th sternites moderate, with outer margin thickened, the tips recurved, sclerotized and pointed.

10th tergites membranous, with three or four small setae from small tubercles below apex.

Description of Larva of **Aedes (Howardina) quadrivittatus** Coq.

Head: Subglobose, the dorsum highly arched, dome-shaped. Preclypeal spines very long, strong, infuscated. Anterior head-hairs similar to the other two pairs of dorsal head-hairs; consisting of from 6 to 9 long hairs forming a tuft. Middle head-hairs somewhat shorter and forming a denser tuft. Posterior head-hairs fewer, and forming a longer tuft. Anteantennal hairs also forming a tuft of about 6 long hairs. Inner occipital hairs very long, slender. Outer occipital hairs set somewhat posterior to inner hairs, long tufts of about 6 hairs each Dorsal eye-hairs long, single. Subantennal (or possibly the postmandibular) hairs multiple, consisting of a tuft of about 15 slender, pointed hairs, not so thick and short or so heavily infuscated as in *A. allotecnon*, n. sp.

Antenna long, slender, tapering, the shaft sparsely spined. Antennal tuft

usually 2-haired, on dorso-internal aspect, inserted somewhat beyond middle, the tips of the hairs scarcely reaching apex of antenna.

Thorax: Integument densely long-pilose, clothed with dense stellate hair-tufts.

Abdomen: Integument densely long-pilose, the pilosity longer on the more posterior segments. Lateral hairs on segment 2 quadruple, single on segments 3 to 6. Comb of eighth segment of about 17 (varying from 13 to 18 in 10 larvae examined) very long, slender scales, set very close together in a nearly straight row. Each scale elongate, thorn-shaped, sharp-pointed, the sides fringed to within a short distance of tip. The scales in *quadrivittatus* are longer and narrower than in *allotecnon* n. sp., and the base to which they are attached is longer and more curved. Siphon slender, tapering, about 4 times as long as wide. Pecten a row of about 15 teeth (varying from 11 to 18 in 10 larvae examined), very closely spaced, extending beyond middle of siphon. Each tooth long, usually with one or two short lateral barbs basally. Teeth progressively longer toward apex of siphon. Siphon-tuft beyond pecten, usually triple, occasionally quadruple, long, the tips of the hairs extending to the apex of the siphon.

Anal segment not ringed by the saddle. Posterior lateral and dorsal margins fringed with long, curved spines. Lateral hair of the saddle long, double. Inner caudal hair long, exceeding the length of the outer caudal hairs, single. Outer caudal hair a tuft of long hairs. Anal gills long, pointed.

TABLE SHOWING MAIN POINTS OF DIFFERENCE BETWEEN THE LARVAE OF *allotecnon* AND *quadrivittatus*.

	Aedes allotecnon n. sp.	*Aedes quadrivittatus* Coq.
Anterior head hairs	Long, double.	Long, multiple tufts of 6 to 9 hairs.
Intermediate head hairs	Long, fine, in tufts of 4 or 5.	Long, multiple, dense tuft.
Posterior head hairs	Long, fine, single.	Long, multiple tuft.
Subantennal hair	More slender elements, and longer than in *quadrivittatus*.	Short, coarse, blunt elements, forming a dense tuft.
Thorax	Integument glabrous, the stellate tufts finer.	Integument long-pilose, the stellate tufts short and strong.
Abdomen	Integument glabrous on first four or five segments, short-pilose on remainder.	Integument long-pilose throughout.
	Comb of eighth segment of 15 scales, long, fringed nearly to tip.	Comb of eighth segment of 17 scales in straight row, elongate, fringed to short distance from tip.

Lateral abdominal hairs on segment 2 triple; on segments 3 to 6 double.	Lateral abdominal hairs on segment 2 triple; on segments 3 to 6 single.
Siphonwithabout 15 teeth. Siphon-hair double or triple.	Siphon with about 17 to 20 teeth. Siphon-hair triple.
Outer caudal hair double.	Outer caudal hair single.

Discussion.

The two species, *quadrivittatus* and *allotecnon* n. sp., are so similar that perfect specimens are required to separate the adult females. The chief differences seem to lie in the different mesonotal markings, and in the markings of the mid and hind femora. In *allotecnon* n. sp. the four golden lines of the mesonotum and the lateral margins are narrow and uniform, giving the appearance of six parallel golden lines on the dorsum. In *quadrivittatus* Coq. the two median lines are parallel, narrow, and uniform, but the golden lines forming the lateral margins of the mesonotum are sinuous, curving outward and surrounding the lateral fossae, and merging with the two parallel subdorsal golden lines anteriorly. The two subdorsal golden lines are sometimes broken before the lateral fossae. Often the lateral fossae are shaded over with golden scales from the subdorsal lines.

The mid and hind femora of our specimens of *allotecnon* n. sp. have a small white spot on the outer two-thirds; those of *quadrivittatus* are without this spot, but are white basally to one-half of their length. Our material of *allotecnon* n. sp. is insufficient to determine whether this femoral white spot is a constant character, but we believe that it is subject to variation, and that specimens will be found in which the femoral white spot merges with the basal white on the femora.

References.

1. Coquillett, D. W., *Canadian Entomologist*, 34, p. 293, 1902.
2. Howard, L. O., Dyar, H. G., and Knab, F., *The Mosquitoes of North and Central America and the West Indies*, 4, p. 852, 1917.

Explanation of Figures.

Fig. 1. Larval details of *Aedes allotecnon*, n. sp.
Fig. 2. Larval details of *Aedes quadrivittatus* Coq.
Fig. 3. Male terminalia of *Aedes allotecnon*, n. sp.
Fig. 4. Mesosome of *Aedes allotecnon* n. sp.
Fig. 5. Ninth tergites of *Aedes allotecnon* n. sp.
Fig. 6. Mesonotum of *Aedes allotecnon* n. sp.
Fig. 7. Mesonotum of *Aedes quadrivittatus* Coq.